

Image Science Support to Commercial Development

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The Image Science and Analysis Laboratory (ISAL) at Johnson Space Center is continually building, honing, and adapting its image science capabilities to provide optimum support to NASA customers. Often this evolution is driven by the pace of imaging technology, but sometimes the evolution results from new space policy. NASA's effort to commercialize space transportation to and from the International Space Station is a recent example of an agency goal spurring lab evolution.

Under Commercial Orbital Transportation Services (COTS), NASA awarded Space Act Agreements to Space Exploration Technologies (SpaceX, Hawthorne, California) and Orbital Sciences Corporation (Dulles, Virginia) to develop systems that can provide cargo to the International Space Station after the space shuttle retirement. COTS partners will fly demonstration missions of these systems, culminating in each demonstrating a mission that berths with the space station. Under COTS, NASA provides requirements, funding, and high-level oversight, and the companies provide vehicle design, construction, and operation.

To support oversight, NASA secured the services of the ISAL, one of the first Johnson Space Center teams to support commercialization. The traditional model for ISAL support to a program is to partner with a NASA customer on every step of the image science process—from the design of imagery acquisition, through the meticulous screening of mission imagery, and ending with the application of image analysis techniques to investigate significant findings derived from the screening. But now, with the agency removed from day-to-day mission development, the ISAL was tasked to help NASA design an engineering imagery plan that could provide a feel for overall performance but, in the event of a mishap, would be adequate to support an accident investigation. The latter is an important element considering that it is fiscally impractical for commercial partners to acquire imaging resources comparable to those already in place at NASA's Kennedy Space Center.

The first mission that ISAL supported was SpaceX's Falcon maiden flight in June 2010 from launch complex



Fig. 1. The SpaceX Falcon 9 with the Dragon vehicle demonstration flight on December 8, 2010. (Photo courtesy of SpaceX.)

40 at the Cape Canaveral Air Force Station. The ISAL worked with NASA managers to establish vehicle events and features of interest. The ISAL then coordinated with Kennedy Space Center imagery teams to design a camera

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complement, imagery acquisition plan, distribution plan, and schedule. This included the acquisition of high-quality still images to document the preflight condition of the vehicle and ground structures. This vehicle configuration imagery is essential to the imagery screening process and to any subsequent image analysis.

During and after the launch, the ISAL screened each piece of imagery with an experienced eye from their support to numerous NASA launches. They also leveraged Kennedy Space Center launch experts to screen the same imagery set. Launch findings were documented in a custom database with access limited to key NASA and SpaceX personnel, due to the proprietary nature of the imagery. NASA managers used the database to identify events of interest, but they also provided the database to SpaceX to offer insight into things that cannot be monitored or detected in telemetry. Additionally, a courtesy copy of the NASA imagery was supplied to SpaceX via portable hard drives, delivered by overnight mail.

On December 8, 2010, SpaceX launched a second Falcon from Cape Canaveral Air Force Station with their Dragon capsule as an official demonstration flight for the NASA COTS program designated as “C1.” That mission was again supported by the ISAL (figure 1). In late 2011, the ISAL will support SpaceX’s C2 launch and a maiden launch of Orbital Sciences Corporation’s Taurus 2 rocket. In 2012, ISAL will support the second Taurus 2 launch—the official demonstration flight for NASA COTS—and possibly a C3 SpaceX demonstration mission. The Orbital Sciences Corporation missions will launch from Virginia’s Mid-Atlantic Regional Spaceport, adjacent to the Wallops Flight Facility.